

**WHAT IS CLAIMED IS:**

1           1.     A method of designing a phase shifting mask, the method  
2     comprising:  
3                 identifying edges of a first phase region of a phase shifting  
4     mask, the first phase region being located proximate a critical region and  
5     the identified edges not being edges of the first phase region adjacent to  
6     the critical region;  
7                 expanding the identified edges to define a narrow line along  
8     the edges of the first phase region; and  
9                 forming chrome in the narrow line to form a chrome  
10    boundary along the edges of the first phase region.

1           2.     The method of claim 1, wherein forming chrome in the  
2     narrow line to form a chrome boundary includes merging the narrow line  
3     with a chrome database.

1           3.     The method of claim 1, further comprising:  
2                 assigning phase polarities to the first phase region;  
3                 defining edges of the first phase region;  
4                 establishing a boundary around the defined edges; and  
5                 assigning area outside of the established boundary to have  
6     phase zero.

1           4.     The method of claim 3, wherein the first phase region and a  
2     second phase region are assigned phase angles 180 degrees from each  
3     other.

1           5.     The method of claim 4, further comprising generating a trim  
2     mask to remove undesired patterns between the first phase region and  
3     the second phase region.

1           6.     The method of claim 1, wherein the narrow line has a width  
2     of a minimum gate width dimension.

1           7.     The method of claim 1, further comprising defining a  
2     boundary around the critical region.

1           8.     The method of claim 7, wherein defining the boundary  
2     includes defining a boundary around edges having phase 180.

1           9.     The method of claim 1, further comprising defining break  
2     locations to have minimal impact on circuit performance and yield.

1           10.    The method of claim 9, wherein the break locations have a  
2     width that permits patterning and inspection.

1           11.    The method of claim 1, further comprising generating a trim  
2     mask to remove undesired patterns between regions of first and second  
3     phases.

1           12.    A method of generating phase shifting patterns to improve  
2     the patterning of gates and other layers needing sub-nominal dimensions,  
3     the method comprising:

4                 defining critical gate areas;  
5                 creating phase areas on either side of the critical gate areas;  
6                 assigning opposite phase polarities to the phase areas on  
7     either side of the critical gate areas;

8                 enhancing phase areas with assigned phase polarities;  
9                 defining break regions where phase transitions are likely to  
10    occur;

11                generating polygons to define other edges and excluding the  
12    defined break regions; and

13                    constructing a boundary region outside of first phase regions  
14                    to form a chrome border.

1                    13.    The method of claim 12, further comprising:  
2                                       correcting design rule violations; and  
3                                       applying optical proximity and process corrections to phase  
4                    regions to allow proper pattern generation.

1                    14.    The method of claim 12, further comprising generating a trim  
2                    mask to remove undesired patterns between first phase regions and  
3                    second phase regions outside of a desired pattern.

1                    15.    The method of claim 14, wherein the generating is done by  
2                    oversizing boundary and break regions.

1                    16.    The method of claim 14, wherein the chrome border has a  
2                    width of a distance between phase 0 and phase 180 regions.

1                    17.    A method of enhancing clear field phase shift masks with a  
2                    chrome border around outside edges of a first phase area, the method  
3                    comprising:  
4                                       assigning phase polarities to phase areas, the phase areas  
5                    including first phase areas and second phase areas;  
6                                       defining edges of the assigned phase areas;  
7                                       establishing a boundary around the defined edges of the first  
8                    phase areas; and  
9                                       forming a chrome border in the boundary around the first  
10                    phase area.

1                    18.    The method of claim 17, wherein defining edges of the  
2                    assigned phase areas includes defining break regions where phase  
3                    transitions occur and generating polygons including edges but excluding

4 break regions, wherein the polygons are merged with the assigned phase  
5 areas.

1 19. The method of claim 17, further comprising generating a trim  
2 mask to remove undesired patterns between the first phase area and the  
3 second phase area.

1 20. The method of claim 19, wherein the generating is done by  
2 oversizing the boundary and break regions.

1 21. A mask configured for use in an integrated circuit  
2 manufacturing process, the mask comprising:  
3 a critical pattern section defined by first edges of a phase  
4 zero region and first edges of a phase 180 region; and  
5 a chrome boundary region located outside second edges of  
6 the phase 180 region, the second edges of the phase 180 region being  
7 different than the first edges of the phase 180 region, wherein the  
8 chrome boundary region includes an opaque material.

1 22. The mask of claim 21, further comprising a region outside of  
2 defined areas having a phase of zero.

1 23. The mask of claim 21, wherein the opaque material includes  
2 chrome.

1 24. The mask of claim 21, wherein the phase zero region and the  
2 phase 180 region are assigned phase angles 180 degrees from each  
3 other.